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# FORCIBLE CORRECTION OF ANGULAR DEFORMITIES OF THE KNEE

*WITH A REPORT OF CASES*

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By JOEL E. GOLDTHWAIT, M.D., OF BOSTON







## FORCIBLE CORRECTION OF ANGULAR DEFORMITIES OF THE KNEE, WITH A REPORT OF CASES.<sup>1</sup>

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IN an inflammation about the knee-joint, in which there is muscular irritation, the leg flexes; and if this condition be kept up for any length of time, the head of the tibia is drawn backwards, so that the normal relations of the articular surfaces are lost. The knee is flexed and the tibia subluxated backwards.

The cause of this double deformity lies in the direct insertion of the posterior thigh muscles, and in the method of application of the power of the Quadriceps group.

At times rotation of the foot and leg outwards is seen in connection with these other deformities. This is probably due to the fact that the Biceps tendon is inserted far out upon the head of the fibula, and consequently has a longer lever upon which to act than the inner Ham-string group, which antagonizes the Biceps in rotating the leg.

The treatment of these deformities by means of force suddenly applied is not new; nevertheless, from a limited experience, I am confident that the method has received too little attention, and that patients are allowed to go without operation and to remain cripples, or else more serious operations are performed than is necessary. This lethargy undoubtedly is due partly to an incomplete understanding of the operation, but still more because of the faulty apparatus for such use which we have had at our command.

It is with the hope that by a free discussion here to-night we may arrive at a better understanding of the subject, that I present this paper, and offer the deductions which I have made.

Clinically, as these cases are seen, they group themselves pretty definitely into three classes:

(a) Those that are seen during the acute or sub-acute stages of the disease, in which the deformity is maintained entirely by muscular spasm.

(b) Those in which there is complete bony ankylosis, as the result of extensive osteo-arthritis.

(c) Those in which the malposition is maintained by adhesions in or about the joint, as the result of old arthritic or peri-arthritic disease.

The first two classes are dismissed entirely, as forcible straightening should not be considered in their treatment. In the first class simple continued extension, with complete immobilization of the joint, will be found to be all that is necessary; while, in the second class, some bone operation, such as excision or osteotomy, will be required. Forcible correction of the deformity in either of these groups would do harm.

<sup>1</sup> Read before the Orthopedic Section of the New York Academy of Medicine in New York, May 19, 1893.

In the first, the acute trouble would be increased; while in the latter, fracture of the bones, with laceration of some of the soft structures would result.

The third class, which really represents the inter-

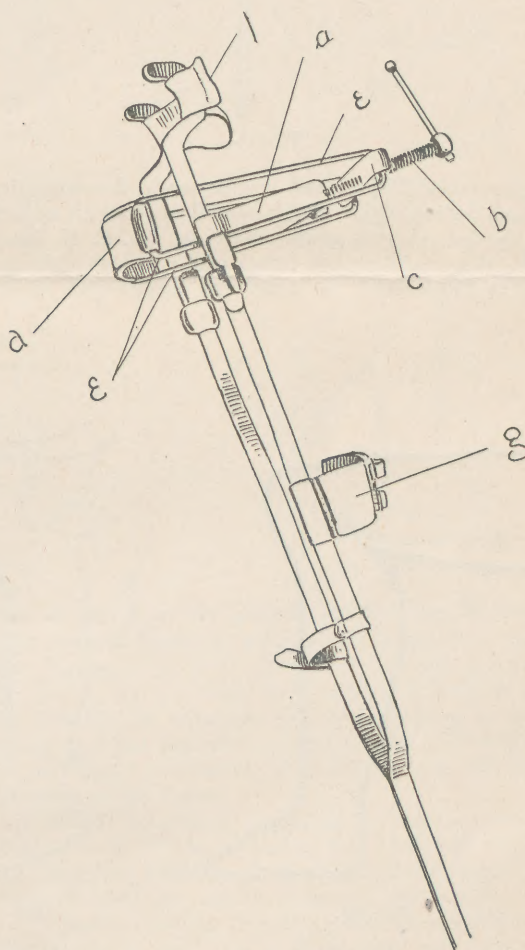


FIG. I.

mediate position between the other two, includes all of those cases in which the malposition is maintained by fibrous adhesions, without regard to the original disease, whether tubercular or otherwise. If the adhesions be slight, they can be broken up with the hands, and the deformity corrected; but if, as is usually the case, the adhesions be firm, the correction is a



very different matter, and mechanical appliances become necessary.

In a paper which was printed in the *Boston Medical and Surgical Journal* of December last, I described

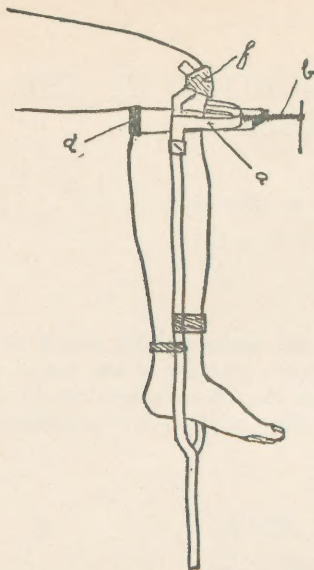


FIG. II.

an apparatus (Figs. I and II) for use in the correction of such deformities. It is a modification of an apparatus, devised several years before, by Dr. E. H. Bradford; the modifications being made to make the apparatus adjustable, to make the application of the

after this the apparatus is applied, with the leg flexed. The posterior band, *d*, is then screwed forward; and after as much force has been applied as seems prudent, the leg is straightened as much as possible, by means of the long lever handle, the power being applied intermittently. The apparatus is then taken off and the leg again manipulated with the hands, to still farther break up the adhesions; after which, with the apparatus, the complete correction is attempted. In a mild case one application may be all that is required, while in others several applications (at one sitting) may be necessary before the position is entirely satisfactory.

At times, when the apparatus is finally removed, the head of the tibia drops back and cannot be held in place, even though the leg be straight, because of the firm contraction of the Ham-string tendons. This may be overcome by division of the tendons, or what was better in one of the cases, the leg was put up slightly flexed, enough to relax the contracted parts, and the dressings allowed to go undisturbed for one week. At the end of that time the tendons had relaxed so much that the leg could easily be straightened, and the correct apposition of the bones maintained. During the operation, the rotation of the leg, which is due to one condyle of the tibia slipping farther back than the other, can be corrected very easily, by simply rotating the apparatus so as to bring the greatest pressure upon the condyle that is posterior. If this last deformity be allowed to remain, it not only produces an awkward gait, from the turning out of the foot, but also, from the posterior position of the outer condyle of the tibia, a more or less marked knock-knee is produced.



FIG. III.



FIG. IV.



FIG. V.

power more easy and more under control, and to have the counter-pressure so directed that no damage could be done to the femur. Its mechanical principles are simple, and its adjustment and use is not difficult.

The operation, which is always performed with the patient anesthetized, may be briefly described as follows: First, the adhesions are broken up as much as possible with the hands only (this in some cases means a good deal, and in others practically nothing); and

At times, however, the knock-knee is due to an elongation of one condyle, as a result of the disease, and a Macewen osteotomy may be necessary; but it is best to wait a few weeks, at least, as in one of the cases in which this deformity was well marked, it entirely disappeared without operation, evidently being due to an old inflammatory deposit on the inner side, which was absorbed.

The after-treatment is simple. A plaster-of-Paris



bandage is applied at the time of the operation, and is not disturbed for one or two weeks; after which the patient is allowed to go about upon crutches, the knee being fixed with the plaster bandage, or, what is better, with a Thomas knee-splint. In a few weeks the apparatus is omitted at night, thus favoring the establishment of motion in the joint; but while the patient is up and about, the splint or some protective appliance should be worn, for from six months to a year.

The pain, which is surprisingly slight, can usually be controlled by the salicylates. Morphine, of course, is to be used if necessary.

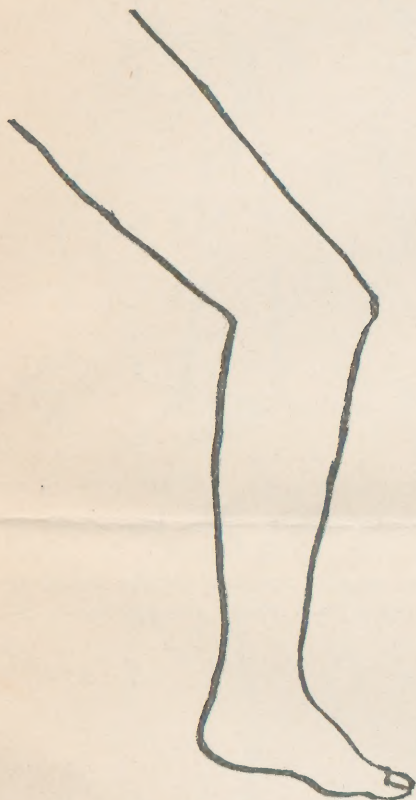


FIG. VI.



FIG. VII.



FIG. VIII.

The following four cases have been operated upon since the paper of last December was published; and in each case the apparatus, figured above, was used.

CASE I. A young woman, sixteen years of age. When thirteen months old, the right leg "drew up," and it has remained in that position ever since.

Figure III represents the position of the leg at the time of entrance to the Massachusetts General Hospital, in December, 1892, flexed to a right angle, with marked subluxation of the tibia, and with only a few degrees of motion in the joint. There was considerable cicatricial tissue in the Popliteal space, but little or no bony thickening.

She was operated upon, and the position corrected without much difficulty. In ten days she was up in a wheel chair, and was about on crutches a week or two later wearing a caliper splint.

Her condition at the present time, six months later, is best understood from the accompanying cuts (Figs. IV and V), which represent the leg straight, and also flexed to show the amount of voluntary motion that is possible; almost ninety degrees.

CASE II. A boy eight years of age. Six weeks before being seen at the Boston City Hospital, in December last, the patient received a wound of the knee-joint, in which the patella tendon was divided. The wound had been neglected, and as a result of the suppuration which followed, the joint structures were badly disorganized. When first seen, the tibia had slipped back, as the result of the absence of the anterior ligaments and tendon, so far that there was scarcely any articulation between the two bones. There was about twenty degrees of flexion. After waiting some time for his general condition to improve, the operation was performed and the tibia drawn forward into place. The position was maintained by a plaster-of-Paris bandage.

The result in this case is a useful leg, but with a stiff knee-joint. This, of course, was expected from the nature of the injury and the subsequent suppuration.

CASE III. A girl fourteen years of age. In Jan-

uary of this year the patient entered the Massachusetts General Hospital, with the leg flexed about forty-five degrees (Fig. VI); the deformity having existed for twelve years. There were several degrees of flexion possible, but extension was restricted, as is shown above, and this limitation of motion was evidently due largely to the position of the patella, which was firmly adherent to the femur.

With the correcting appliance the leg was straightened without difficulty; and as the force was applied, the adhesions between the patella and the femur gave way, allowing free motion between these bones.

The patient was up in a chair the second day after the operation, and a few days later was about on crutches.

At present, about six months later, the leg is straight, as is shown in Fig. VII, and voluntary motion is possible to the position shown in Fig. VIII.

CASE IV. A woman twenty-one years of age. In December of last year the patient entered the Boston City Hospital, and gave the following history. Eleven years previous, she fell striking the right knee. This



was followed by an abscess which opened just below the patella, and from which there has been a slight discharge ever since. At the time of the appearance of the abscess the leg "drew up," and has remained in that position until now. At the time of entrance to the hospital, it was flexed to about a right angle, and subluxated as is shown in Fig. IX. There were only a very few degrees of motion possible.

On December 21st, Dr. Bradford opened the sinus

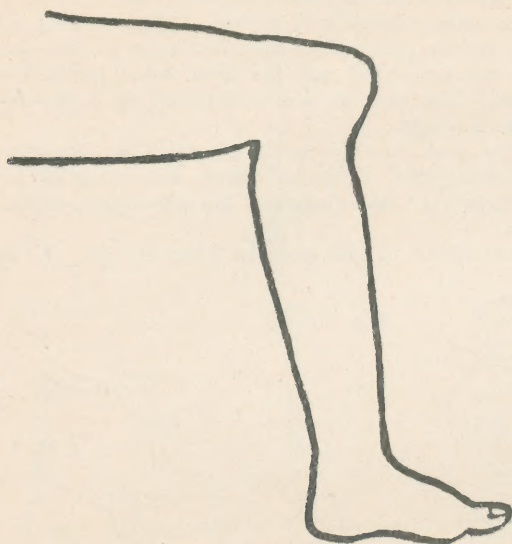


FIG. IX.

below the patella, and removed with a curette, a large amount of dead bone from the head of the tibia. The cavity remaining was about the size of a small lemon. At this time, the correcting apparatus was applied,

constant before the operation has entirely disappeared.

I am indebted to Dr. C. B. Porter for permission to see Cases I and III, to Dr. M. F. Gavin for Case II, and to Dr. E. H. Bradford for Case IV.



FIG. X.



FIG. XI.

I wish, also, at this time, to give a later report of one of the cases of the December series. The patient was a girl sixteen years of age, in which the deformity had existed for eight years before the operation. It

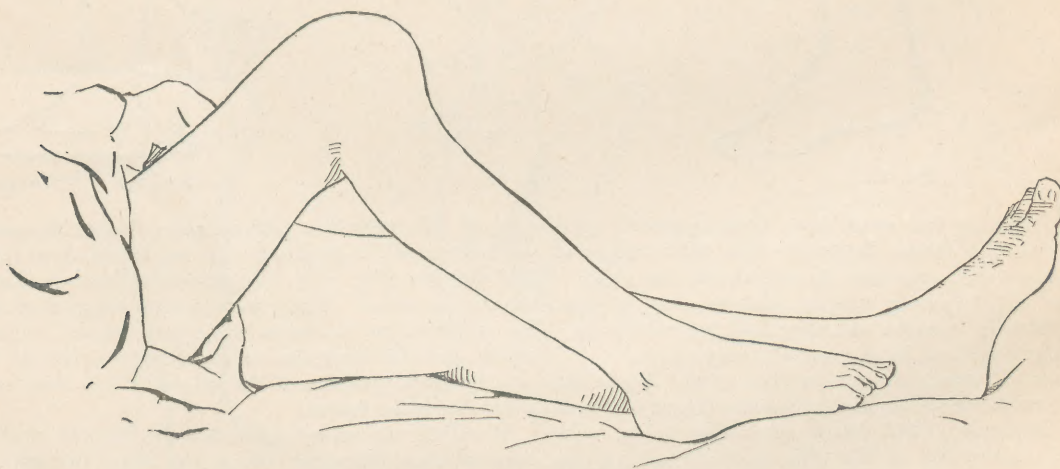


FIG. XII.

and the leg partially straightened; but because of the danger of fracturing the tibia in its weakened condition, the correction was not completed.

Two months later the cavity in the tibia having filled up, the apparatus was again applied and the leg fully straightened.

At the present time the patient is walking about, wearing a Thomas caliper-splint, with the leg straight, as is shown in Fig. X, and with several degrees of voluntary motion (Fig. XI). The pain which had been

is now a year since the leg was straightened, and all apparatus has been omitted for about two months. She walks well, there being enough motion in the joint to prevent the marked limp common with a stiff knee, and there are no uncomfortable symptoms. Fig. XII shows her condition before operation, Fig. XIII, the leg straight, and Fig. XIV the amount of voluntary free motion.

In considering these cases, Case I seems to be worthy of special attention, and is of interest as a



physiological experiment as well as a surgical result. The fact that a joint can be put out of use for nearly fifteen years, and then restored to use with very nearly the normal amount of motion, is not only a matter of interest but of surprise. To be sure, the original disease had been largely in the tissues about the joint, judging from the position of the cicatrices; but even where there has been no joint injury or disease, as in fractures of the long bones—in which it is necessary to confine the adjacent joint for a long time—it has



FIG. XIII.

always been supposed (except for Dr. Phelps's experiments on dogs) that the functions of the joint would be seriously impaired, due to the formation of fibrous adhesions inside of the capsule. In this case, in one week from the time of the operation there was nearly normal voluntary motion without pain; at least strongly suggesting that no intra-articular changes had taken place.

The results in the other cases need no special comment; the illustrations represent their condition better than any verbal account.

In calling attention to this treatment it is to be understood that the original cause of the deformity is of little consequence, and that whether it be rheumatic, gonorrhœal, or tubercular; or whether the disease has been confined to the joint or to the structures about the joint, the deformity can be corrected as thoroughly and without much more danger, in one case as in the other. In the tubercular cases a considerable interval, at least two years, should be allowed after the disappearance of all of the acute symptoms, before the correction be attempted, because of the danger of starting up the tubercular process. In the gonorrhœal or rheumatic cases the apparatus can be applied at any time where it is reasonable to suppose, from the duration of the disease, that adhesions have formed. Usually in these cases the pain will cease with the restoration of motion.

The dangers attending the use of the apparatus are very slight, if its principles are understood and ordinary precautions are used.

In the acute cases, and in those in which there is bony ankylosis, its use is contraindicated, for reasons stated above. The danger of lacerating the vessels and nerve in the Popliteal space, from the application



FIG. XIV.

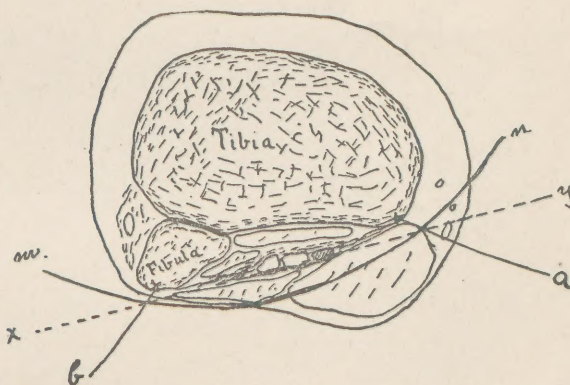


FIG. XV.

of so much force, is very slight. As was shown in the paper before referred to, the head of the fibula, and the inner condyle of the tibia act as buttresses; and upon these points the pressure is applied, while the vessels lie deep in the muscles entirely protected, as is shown in Fig. XV. In cases of extensive peri-articular disease behind the joint, it would be better to straighten the leg gradually, gaining a little with each operation, rather than to correct it at one sitting; in which case the vessels might be lacerated, from being involved in the old cicatrix. This precaution should



also be taken in elderly persons in which atheromatous changes in the vessels are to be considered.

CONCLUSIONS.

A special apparatus is presented for the correction of the angular deformities of the knee in which there is fibrous ankylosis. Five cases are reported in all, of which the ultimate results, as to usefulness of the

leg, are very good. One case, in which the deformity had existed almost fifteen years, has nearly normal motion in the joint. One case is reported in which all apparatus has been omitted one year after operation. In none of the cases has any acute trouble resulted. The operation and the use of the apparatus is not difficult, and the dangers attending its use are comparatively slight.







